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THE NAVAL AIRCRAFT COMPONENT MODIFICATION
PROGRAM--PROBLEMS AND RECOMMENDATIONS

by

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December 1988

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The Naval Aircraft Component Modification Program--
Problems and Recommendations

by

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ABSTRACT

Lack of strong central direction and inconsistent policy execution by all levels have led to a number of problems in the implementation of component modifications in Navy aircraft. The problems dealt with in this study are confined to the areas of replacement procedures for installed components, implementation schedule, inventory support (spares, piece parts), and modification funding. The results of these problems have been excessive disruption of aircraft readiness and inefficient use of resources. Recommendations are proposed to improve component replacement procedures, retain some standardization during the change process, improve spares inventory support, and clarify funding responsibilities.

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TABLE OF ABBREVIATIONS

AFC	Airframe Change
AIMD	Aircraft Intermediate Maintenance Department
AIRPAC	Naval Air Forces, Pacific
ASE	Automatic Stabilization Equipment
ASO	Aviation Supply Office
AVC	Avionics Change
AVCAL	Aviation Consolidated Allowance List
AVDLR	Aviation Depot Level Repairable
CASWWP	Commander, Anti-Submarine Warfare Wing, Pacific
CC	Configuration Control
CFA	Cognizant Field Activity
CI	Configuration Identification
CILOP	Conversion in Lieu of Procurement
CM	Configuration Management
CNAP	Commander, Naval Air Forces, Pacific
CSA	Configuration Status Accounting
CV	Aircraft Carrier
D LEVEL	Depot Level
ECP	Engineering Change Proposal
FGC	Family Group Code
FMC	Fully Mission Capable
GFE	Government Furnished Equipment
I LEVEL	Intermediate Level

IC	Interchangeability Code
ICP	Inventory Control Point
LAMPS	Light Airborne Multi-Purpose System
MOD	Modification
NADEP	Naval Aviation Depot
NAMO	Naval Aviation Maintenance Office
NARF	Naval Air Rework Facility
NAS	Naval Air Station
NAVAIR	Naval Air Systems Command
NIS	Not in Stock
NRFI	Not Ready for Issue
NSN	National Stock Number
O LEVEL	Organizational Level
OOA	Out of Area
OPNAV	Office of the Chief of Naval Operations
OSIP	Operational, Safety, and Improvement Program
PIP	Product Improvement Program
PUK	Pack-up Kit
RAMEC	Rapid Action Minor Engineering Change
RFI	Ready for Issue
SASS	Supplemental Aviation Spares Support
SDLM	Standard Depot Level Maintenance
SHORCAL	Shore Consolidated Allowance List
SLEP	Service Life Extension Program
SRA	Shop Replaceable Assembly
TACNAV	Tactical Navigation

TD	Technical Directive
TYCOM	Type Commander
WRA	Weapon Replaceable Assembly

I. INTRODUCTION

A. BACKGROUND

Modifications to aircraft components have played an important role in ensuring a high degree of effectiveness and sustainability within the Naval aircraft community. Implementing changes in meeting new technological threats, extending aircraft service life, and correcting safety deficiencies is often a better cost-effective option than acquiring new aircraft.

Formal approval of modifications for budgetary purposes rests with the Chief of Naval Operations (OPNAV). Responsibility for the overall management of the Naval aircraft *modification* program lies with the Naval Air Systems Command (NAVAIR). NAVAIR delegates this responsibility to the Naval Aviation Maintenance Office (NAMO). NAMO is responsible for planning and executing modifications through Navy laboratories/field activities and/or private contractors.

The author's previous tour of duty was Staff Supply Officer at the Anti-Submarine Warfare Wing, U. S. Pacific Fleet (CASWWP). This is the largest functional air wing in the U. S. Navy, responsible for 26 squadrons and a major Naval air station (NAS North Island). The squadrons represent more than 200 aircraft, consisting of about a dozen major aircraft types, each of which may have a number of varying configurations.

At CASWWP, modifications posed a daily struggle for the staff maintenance and supply personnel. Daily message traffic invariably included a number of change directives and miscellaneous logistics problems resulting from modifications. The staff, along with personnel at the NAS and squadron levels, was consistently operating in a reactive mode. It is hoped that this study will clarify some of the recurring problems with component modifications at the implementation level and point out possible solutions.

B. OBJECTIVES

A detailed study will be made of the actual implementation of aircraft component modifications at the organizational (squadron) and intermediate (NAS) levels. This will include installed components in aircraft, spare components for inventory, and supporting piece parts for inventory. Problems being experienced by the squadrons and the supporting Naval air station will be discussed and analyzed through the use of two case studies, with the primary focus being their impacts on aircraft readiness rates.

C. SCOPE, LIMITATIONS, AND ASSUMPTIONS

Due to travel funding constraints and a veritable endless supply of available data, the scope of this research was limited to three aircraft applications and one supporting air station; SH-2, SH-3, and SH-60 aircraft and Naval Air Station (NAS) North Island, California. The three aircraft types were carefully selected. Each represents a distinct major category with respect to the modification programs, and therefore has both unique and common problems that will be discussed.

The SH-2 is a well-established aircraft supporting the Light Airborne Multi-purpose System (LAMPS) program (helicopters assigned to destroyers, frigates, cruisers) and is currently undergoing retrofit (updating components to standardize configuration of an aircraft type) and procurement of some new aircraft simultaneously. The SH-3, another well-established aircraft, supports aircraft carrier (CV) operations and is undergoing a major modification program called Conversion in Lieu of Procurement (CILOP), a consolidated array of changes which result in a completely new configuration. The SH-60 is the Navy's newest helicopter and is still in full production. It is designed to support both the LAMPS program (SH-60B configuration) and aircraft carrier operations (SH-60F configuration).

Research data collected and utilized is unclassified. Pertinent classified data was reviewed during the research period, but primarily reiterated ideas contained in unclassified data.

A basic assumption in this thesis is that many of the problems being experienced in the SH-2, SH-3, and SH-60 programs are being experienced Fleet-wide due to common deficiencies. This is supported by informal conversations between the author and maintenance/supply personnel who have recently worked with other aircraft types and by the author's previous experience with aircraft maintenance and material problems.

D. SUMMARY OF FINDINGS

1. Component Replacement Program Policy

In situations where unmodified items have to be removed from aircraft for modification and then re-installed, the policy's goal under normal conditions should be to minimize downtime of the aircraft. This is done by allowing the squadron to receive a modified component before having to remove the unmodified component. In many cases, this is not occurring and results in frequent aircraft readiness degradation. In addition, there were often many obstacles which interrupted the flow of unmodified components from the Fleet to the modification facilities.

2. Implementation Schedule

In many cases, more than one squadron were undergoing a component modification simultaneously. Also, in one case, a second aircraft type started undergoing a modification while the first aircraft's component spares were still being modified. Because the changes were long-term, this resulted in a multitude of different configurations spread across organizational lines. The complexities of logistics support in these situations increase exponentially.

3. Spares Lag Behind Installed Changes

This is perhaps the most prevalent and hard to solve problem area. Changes to installed components, often driven by operational planners, occur as much as two or three years (sometimes longer) before adequate spares are available in the Navy inventory. Contributing to this problem are the lengthening of procurement lead times for spares at the Aviation Supply Office (ASO), lack of adequate logistics support planning at NAVAIR, and contractor delivery delays.

4. Items Applicable to Specific Production Lots (Lot-Peculiar)

Aircraft having an active production line are being produced in consecutive lots, each lot having some components unique to that lot. This has caused a myriad of problems in inventory support for the components themselves and the associated piece parts.

5. Family Group Coding

As an Inventory Control Point (ICP--ASO for aviation parts) management strategy, components that are either partially or totally interchangeable with each other are grouped together and assigned a Family Group Code (FGC). Partially interchangeable means that they may be interchangeable under certain conditions (i.e., if modified in some way). The coding has been inconsistent in that some fully interchangeables belong to different families and some non-interchangeables belong to the same family. This has been particularly prevalent with modified components. As a result, the wrong item is often issued to an end user or a not-in-stock (NIS) status is given when a fully interchangeable item is actually available. It has also caused problems in the Aviation Depot Level Repairable (AVDLR) program.

6. Aviation Depot Level Repairable (AVDLR) Program Funding Problems--NAS Level

Repairable items that must be repaired at the depot are now funded by each supporting NAS vice being centrally funded (under the old system). When a not-ready-for-issue (NRFI) item is sent to the depot for repair, a ready-for-issue (RFI) item is ordered by the NAS at the net price (estimated cost of repair). If the NRFI item is not available for turn-in, the RFI item must be ordered at the standard price (often much higher than net). As a result of the FGC problem cited previously, NRFI items are often turned in, but do not show as a credit to the NAS because the NRFI and RFI h ve different FGC's. Thus, the NAS is charged the much higher standard price vice the lower net price for the RFI item. In order for the NAS to receive proper credit, they must challenge each of the erroneous charges through an off-line process.

An additional funding problem related to modifications is that many of the repairable and consumable (throw-away) items (required for the modification and listed in the Technical Directive or TD) are not funded by NAVAIR but must be procured by the NAS. For repairables, this is often at the relatively high standard price. Also, items missing from modification kits previously procured by NAVAIR are often purchased using NAS funds in order to expedite the modification.

E. ORGANIZATION OF STUDY

The remaining sections are organized in the following manner. Chapter II gives a brief description of the procedural guidance for Naval aircraft component modifications. The request and implementation processes are discussed in detail followed by brief summaries of three interface programs--Configuration Management, Interim Support, and Navy Supply Support.

Chapter III provides the methodology used by the author in conducting research. It is presented as a four step process, although some steps overlap with others.

Chapter IV presents two case studies which exemplify many of the system problems existing with component modification programs.

Chapter V provides an analysis of the two case studies presented in Chapter IV. It also discusses four general categories of problems in component modification implementation, citing specific examples where appropriate.

Chapter VI summarizes the main points of the thesis and presents eleven recommendations with supporting cost-benefit analyses to assist in making the Naval Aircraft Modification Program more effective and efficient with less traumatic impact on aircraft readiness.

II. PROGRAMS AND POLICIES

The following discussion will outline the current aircraft modification program, with emphasis on the Fleet interface. It will also include related areas such as configuration management, interim support, and full Navy support policies.

A. THE NAVAL AIRCRAFT MODIFICATION PROGRAM

1. OSIP, CILOP, SLEP Programs

The Navy's overall modification program is designated the Operational, Safety, and Improvement Program (OSIP). Its purpose is to define, develop, acquire, and install engineering changes designed to modernize and improve the safety, reliability, maintainability, readiness and/or combat effectiveness of in-service aircraft. [Ref 1:p. I-1] Within the broad area of changes under OSIP, two significant areas are worth mentioning. These are the Service Life Extension Program (SLEP) and the Conversion in Lieu of Procurement (CILOP) Program. The purpose of SLEP is to extend the life of a current weapons system. While some technological upgrades may be accomplished, the primary purpose is service life extension. CILOP, on the other hand, is the conversion of a configuration no longer meeting a threat to a new configuration which will meet the threat.

It involves numerous technological upgrades. While having separate purposes, the commonality of some of the upgrades for both programs may result in a merged effort. This is also dependent on the timing in the particular weapon's life cycle.

The intent of this paper is to focus on individual component modifications that are not part of a comprehensive program such as SLEP or CILOP, but do come under the OSIP umbrella. This is where most problems seem to occur.

2. Modification Requests

Requests for modifications can originate from three primary sources. The first is from the particular weapons system branch at NAVAIR. [Ref. 1] Personnel involved in the program management of a specific aircraft are in a position to spot deficiencies, through an effective monitoring of contractor efforts and Fleet reports.

A second major source is from contractor or Navy repair/production facilities. These changes are submitted to NAVAIR in the form of Engineering Change Proposals (ECP's).

The third primary source of modification requests originate from the Fleet. These modifications are usually minor in nature and are designated Rapid Action Minor Engineering Changes (RAMEC's). There are two phases to the Fleet request process. The first phase is a RAMEC request to modify a single aircraft. It can be submitted by a squadron or field activity having cognizance over the specific aircraft type. Approval is at the Type Commander (TYCOM) level. General items which must be considered are: [Ref. 2:p. 4-5]

- Logistics material requirements
- Use of space already reserved for approved changes
- Crew confusion if aircraft is transferred
- Expenditure of unplanned man-hours and material
- Performance characteristics being adversely affected
- Configuration provides optimum conditions of safety, operational, and material readiness

The initial RAMEC request must include a detailed description of the modification and the rationale justifying the proposed action. [Ref. 3] Once the TYCOM approves the preliminary RAMEC, the change is implemented in the designated aircraft.

The second phase in the RAMEC process is to request a change to all similar aircraft in the Fleet. The format for the formal RAMEC is shown in Appendix A. [Ref. 3:encl. (1)] The TYCOM will review the proposal, have another activity verify the change (in some cases), coordinate a review of the proposal from the Weapons System Manager (at NAVAIR) and Cognizant Field Activity (CFA) for the aircraft type (usually the depot repair facility), and forward the entire package to NAVAIR.

The NAVAIR Change Control Board (CCB) reviews change proposals from all three primary sources within thirty days of receipt of the request. If approved, NAVAIR will issue the required change order to the Fleet via a Technical

Directive (TD). [Ref. 4] Format for the TD is given in Appendix B. [Ref. 4:encl. (4)] Various TD codes applicable to types of changes are given in Appendix C. [Ref. 2:appen. L] This paper is primarily concerned with Airframe Changes (AFC's) and Avionics Changes (AVC's). AFC's deal with elements of the airframe and AVC's deal with electronic assemblies ("black boxes"). Often, AVC's are incorporated as part of an overall AFC.

3. Implementation of Modifications

NAVAIR issues the TD and is also responsible for funding modification of installed components and for ensuring the distribution of modification kits and government furnished equipment (GFE) required to modify the aircraft's components. Data regarding modification kits, GFE, and spares/piece parts for inventory are provided to ASO by NAVAIR for initiation of procurement action. As previously stated, management of the modification program is delegated by NAVAIR to the Naval Aviation Maintenance Office (NAMO). [Ref. 5] NAMO expedites needed material to the Fleet in accordance with the time deadline set for modification completion. This deadline depends on the TD category. Categories and deadlines are shown in Table I. [Ref. 6] The goal is to complete the modification within the timeframe allowed. The TD rescission is a later point in time when it is assumed that the change is complete and that excess modification material can be reallocated. If the change is not yet complete by the rescission date, the TD will remain open but special management attention will be focused on completing the change as quickly as possible. [Ref. 5]

TABLE I

TECHNICAL DIRECTIVE TIMEFRAME CATEGORIES

Category	Installation Timeframe From Date Of Issue	TD Rescission
I--Immediate action	120 days	2 years
U--Urgent action	18 months	5 years
R--Routine action	36 months	6 years
K--Record purpose (change already completed prior to issuance of TD)	N/A	2 years

Changes may require depot level implementation (Naval Aviation Depot--NADEP or contractor), intermediate level (Aircraft Intermediate Maintenance Department--AIMD), or organizational level (squadron). Depot (D level) performs the most complex tasks, intermediate (I level) performs medium to low complexity tasks, and organizational (O level) is limited primarily to removing and installing components. If the change requires D or I level action, a field modification team will often go to the aircraft vice requiring the aircraft to be transported to the maintenance facility.

B. CONFIGURATION MANAGEMENT

Although changes are often the best option from a cost-effective or safety standpoint, the number and extent of changes must be controlled and documented. As the number of different configurations multiplies, the level of complexity for the support functions increases exponentially. Each time an aircraft component is changed, it may require a multitude of other changes including:

- Inventory support for new/modified component
- Inventory support for piece parts
- Modify inventory support for old component/piece parts
- Change to test and support equipment
- Maintenance training on new component
- Operator training on new component

Thus, the Configuration Management (CM) Program was developed to deal with the rapidity of changes in an ever-changing technology while exercising a requisite amount of control. Three major areas comprise the CM Program. [Ref. 7:chap. II]

1. Configuration Identification (CI)

CI is the process of identifying current configurations and maintaining records documenting same.

2. Configuration Control (CC)

CC encompasses the review process for changes and the planning and implementation of those changes. This includes monitoring and documenting modification completions.

3. Configuration Status Accounting (CSA)

CSA is the reporting and documentation activities involved in maintaining continual status throughout the change process.

C. INTERIM SUPPORT

Due to the long procurement lead times in acquiring material for stock, an interim support program is often set up when introducing a new weapons system. Interim support material is owned by the contractor but located close to the customer (a selected Navy activity). It is sold on an item by item basis as requirements arise. Thus, support is provided until the Navy can procure sufficient stocks in its inventory. In the past, this has been primarily used during the introduction of major weapons systems. However, a recent move has expanded it aboard aircraft carriers to include new components/repair parts in addition to entire systems. [Ref. 8] Applicability to shore support facilities is still being developed.

D. NAVY SUPPLY SUPPORT

Navy inventories are divided into three categories. First is the wholesale level. This is stock managed by the Inventory Control Point (ICP). The ICP for aviation material is the Aviation Supply Office (ASO). Wholesale material is stocked at a number of stock points worldwide and is used as a back-up for the next two levels.

The next level is called retail intermediate. This is stock managed by the stock points to support their respective geographical regions. It is a back-up for retail consumable inventories and, at times, used for direct support to end users.

The third level is retail consumable. It is managed by retail activities (ships, NAS's) and has fixed allowances (maximum quantities authorized) for each line item based on the number and type of aircraft supported. At an NAS, retail consumable stock can be split between air station support and Light Airborne Multi-purpose System (LAMPS) support. Aircraft carrier (CV) support stock is called the Aviation Consolidated Allowance List (AVCAL), NAS support stock is called the Shore Consolidated Allowance List (SHORCAL), and LAMPS support stock is in the form of pack-up kits (PUK's), also called Supplemental Aviation Spares Support (SASS).

III. METHODOLOGY

A. DATA GATHERING

The first stage in the research effort was to gather copies of applicable instructions and other written communication. This was accomplished by reviewing the Naval Postgraduate School Library files, requesting related topic information from the Defense Logistics Studies Information Exchange (DLSIE), and telephone requests for copies of instructions from NAVAIR, ASO, CNAP (Commander, Naval Air Forces, Pacific), and CASWWP. The data was then sorted and reviewed in preparation for the research visit. A list of questions and in-depth areas for study were developed.

B. RESEARCH VISIT

A one week visit was conducted at NAS North Island where three echelons within the Naval Aviation Command structure are co-located, CNAP, CASWWP, and NAS/squadrons. Two days were spent at the NAS/squadron level conducting personal interviews with key maintenance and supply personnel. Two days were spent at the functional wing (CASWWP) level, again conducting interviews with key personnel. One-half day was spent interviewing type commander (CNAP) staff personnel and one-half day utilized to consolidate the information gathered and investigate any obvious discrepancies.

Throughout the week, calls were made to other interface commands as required. Also, the author reviewed countless instructions, messages, and other written correspondence, making copies of the more pertinent ones for later use during the write-up.

C. DATA REVIEW

Following the research trip, much time was spent sifting through the data collected. It was sorted in accordance with the thesis chapters and material that was either redundant or non-applicable was discarded.

D. FOLLOW-UP

After becoming familiar with the data collected, the author began to make notes and formulate additional questions. Follow-up telephone interviews and, when possible, personal interviews were conducted to obtain answers. Also, some additional written data was received. These follow-up actions continued through much of the rough draft preparation stage.

IV. PRESENTATION OF DATA

Much of the problem data in this and the following chapter resulted from personal interviews with maintenance and supply personnel at the squadron and NAS levels, as well as data provided by the functional wing and type commander staffs. In addition, the author's previous tour of duty at the functional wing provided valuable insight into many of the more complex issues. Supporting documentation includes Naval message traffic, minutes from meetings, and reports tailored to a particular weapon system.

This discussion will consist of case histories on two major components that have undergone modification, the Tactical Navigation System (AN/ASN-123 TACNAV) for the SH-2 and SH-3, and the Automatic Stabilization Equipment (ASE) for the SH-3. These particular modifications required action and coordination by a number of different echelons. Both were selectively chosen and are not typical of component modifications in general. However, the problems experienced thus far in both cases are indicative of problems being experienced in a number of other component modification programs.

A. CASE STUDY--TACTICAL NAVIGATION SYSTEM (AN/ASN-123 TACNAV)

1. Background

The AN/ASN-123 TACNAV Product Improvement Program (PIP) commenced in May 1985 for the SH-2 (AFC 302) and in February 1987 for the SH-3 (AFC's 420/424/428). This retrofit program consisted of converting the AN/ASN-123A to an AN/ASN-123C configuration by modifying five major repairable components or Weapon Replaceable Assemblies (WRA's) that were installed in aircraft and held in inventory. These five components were a computer processor, display indicator, control indicator, computer control, and mount. It also included the procurement and distribution of both supporting repairable components or Shop Replaceable Assemblies (SRA's) and supporting piece parts (consumables) for stocking in the inventory. [Ref. 9] A presentation summary of significant program elements is provided in Appendix D.

SH-2 aircraft coming off the production line were equipped with the AN/ASN-123C configuration starting in February 1985. This meant that all SH-2 aircraft produced prior to that date had to be modified as well as all SH-3 aircraft. Inventory spares to be modified included those at wholesale, retail intermediate, and retail consumable levels. The retail consumable level included the SHORCAL's, AVCAL's, and PUK's.

Actual modification of both installed components and spare TACNAV systems would be performed by Teledyne Systems located at Northridge, California. The original plan at NAVAIR was to send eight sets of the AN/ASN-123A per month to Teledyne for modification, starting with the SH-2. These sets would be a combination of installed components and spares. Teledyne, starting with an initial pool of eight modified units, would immediately send one AN/ASN-123C set to the Fleet upon receipt of an unmodified unit. This replacement program would preclude extraordinary delays while maintaining asset accountability.

2. Implementation

Shipments from the Fleet began in late 1985. By February 1986, the Fleet was experiencing delays in receipt of modified components. [Ref. 10] Reasons given by Teledyne were contractor/subcontractor technical difficulties. The delays were causing squadrons to cannibalize (remove from one aircraft and install in another) systems from low priority to high priority aircraft and to send LAMPS detachments to sea with no spare TACNAV's in the PUK's. This seriously degraded aircraft readiness and resulted in many additional man-hours spent cannibalizing and expediting.

As a standard procedure of the retrofit program, screening of Fleet activities for old configurations was also being performed. There were numerous problems associated with this effort. First, Teledyne would only accept complete TACNAV systems (all five WRA's) for modification. Therefore, Fleet activities with some WRA's in inventory needing modification were put on hold because they were missing other WRA's. The policy was finally changed in early 1987. Teledyne decided to accept incomplete systems and modification would occur on a "not to interfere" basis with completed systems. [Ref. 11]

A second problem with the screening process was that many of the assets held in PUK's were constantly being transferred between ships or between a ship and its supporting NAS. Custody could easily change in the time between screening and issuance of a shipping directive.

A third problem was that many assets were unauthorized spares (not on record) and the formal screening process was ineffective in dealing with this problem.

The retrofit program for the SH-2 continued through the remainder of 1986. By January 1987, all SH-2 installed components had been modified. [Ref. 12] Spares supporting the SH-2 were still undergoing modification. The decision was made to immediately commence the retrofit program for the SH-3. Spares for the SH-2 would now compete with installed components and spares for the SH-3. Meanwhile, the screening process continued with very limited success due to the problems previously noted.

With aircraft carrier support always a high priority, the introduction of the SH-3 brought a heightened interest to the retrofit program. Of particular note was a situation involving the USS MIDWAY. The MIDWAY, due to its forward deployed status, receives more attention on the average than other aircraft carriers. Its squadron's SH-3 aircraft were among the first to receive the modified TACNAV. However, as with other activities, its inventory, or AVCAL, did not simultaneously receive spares or supporting piece parts for installed components. In March of 1987, the USS MIDWAY requested expediting assistance due to NRFI installed components with no spares to repair or replace. [Ref. 13] The SH-3 Fleet activities were now beginning to experience what the SH-2 activities had experienced for the past year-and-a-half: readiness degradation due to lack of spares' support.

The old nemesis, screening for unmodified systems, had reached a critical stage by October 1987. Fifty systems could not be located following a worldwide screen by ASO. [Ref. 14] The retrofit program was due for completion in June 1988. The plan was for all unmodified systems to be shipped to Teledyne by March 1988. Thus, NAVAIR directed ASO and the TYCOM's to conduct a physical screen (visually sight components) at activities under their cognizance. [Ref. 15] This was completed and some additional unmodified systems were discovered.

At the time of this writing, a search is still being conducted for close to 50 unmodified systems. The modification line at Teledyne remains open but cost-effective pressures may soon shut it down. All installed components have been modified. Allowances have been established in the SHORCAL's, AVCAL's, and PUK's for modified WRA's, SRA's, and piece parts. However, many are still waiting for actual assets to fill allowance levels. [Ref. 16]

B. CASE STUDY--AUTOMATIC STABILIZATION EQUIPMENT (ASE)

1. Background

The SH-3 ASE Modification Program commenced in October 1985 (AFC 396). This program consisted of modifying two WRA's that were installed in aircraft and stocked in inventory. The two components were an ASE amplifier (amp) assembly and a control panel. The ASE amp contained seven SRA's which had to be procured and stocked in inventory along with supporting piece parts for both the WRA's and SRA's. The part number suffix was used to distinguish the unmodified ASE amp from the modified, -21 for the old amp and -25 for the new. [Ref. 17]

The modification would be performed at the Naval Air Rework Facility (NARF), Pensacola, Florida (now renamed Naval Aviation Depot). In order to establish an initial pool of assets, the plan was to remove and modify -21's from

SH-3's undergoing Standard Depot Level Maintenance (SDLM), an aircraft periodic overhaul, at NARF Pensacola. However, this pool would be decreased somewhat because of the requirement that aircraft leaving SDLM would have the -25 installed. [Ref. 18] Once a pool was established, Fleet activities would request -25's from NARF Pensacola. Once the components were received, -21's would be sent back to the NARF.

2. Implementation

Requisitions were first submitted for the -25 in early 1986. There was an immediate problem of insufficient -21's (retrograde) at NARF Pensacola. NAVAIR reiterated the requirement for Fleet activities to immediately ship retrograde upon receipt of -25's. [Ref. 19]

Meanwhile, requests for AVCAL and SHORCAL allowances for WRA/SRA/piece parts were being submitted. Early indications of high failure rates resulted in higher and higher stock level adjustments. [Ref. 20]

Continued failures in the -25, as documented by Fleet squadrons, resulted in a suspension of the modification program by NAVAIR in June 1986. Modification of WRA's was halted but SRA's would continue to be modified to support -25's already in the Fleet. An engineering investigation was begun to determine the cause of the problems. [Ref. 21]

The suspension in the middle of a major retrofit program created a myriad of logistics support problems. Within squadrons, some aircraft had the -21 and others had the -25. Those preparing to deploy overseas could not afford the luxury of having both configurations due to both operational and maintenance/supply support considerations. Because the -21 enjoyed greater maintenance and inventory stock support, the decision was made to deconfigure all aircraft in each deploying squadron back to the -21. This resulted in numerous cannibalizations and cross-decking (shifting assets from one ship to another) actions. [Ref. 22]

Following an extensive investigation which involved numerous flight tests and technical reviews, the problems were resolved and the retrofit program was re-started in January 1987. [Ref. 23] Due to the lessons learned from the deconfiguration process, the revised retrofit schedule reflected a policy of modifying one squadron at a time. An additional benefit to this policy was that AVCAL allowances for squadrons' respective ships could now be timed to coincide with the schedule. However, other problems still developed.

Almost immediately, the consistent lack of spares started to impact aircraft readiness. [Ref. 24] Each time an installed ASE would fail, there were no assets in stock to replace it and, therefore, the aircraft's mission capability was partially degraded for an extended period of time. On an aircraft carrier, this was particularly acute since one aircraft represents one sixth of the ship's SH-3 squadron.

At NARF Pensacola, other problems were hampering efforts to turn out -25's. The low influx of -21's plus a shortage of modification kits had combined to slow the modification line. [Ref. 25] Fleet activities responded by expediting shipment of -21's to the NARF and NAVAIR increased the availability of modification kits.

At the time of this writing, all installed components have been modified. All inventory allowances have been established for WRA's, SRA's, and piece parts. Most of the WRA allowances have been filled in the AVCAL's but not in the SHORCAL's. Both AVCAL's and SHORCAL's are still awaiting many SRA's and piece parts. [Ref. 16]

V. DATA ANALYSIS

The first part of this chapter will analyze each of the two case studies presented in the previous chapter. This will be followed by a presentation and analysis of problem categories in component modification programs, citing examples from the SH-2, SH-3, and SH-60 aircraft communities. The intent of this analysis is to offer the author's interpretation of the problems and the extent of their impacts.

A. CASE STUDY--TACTICAL NAVIGATION SYSTEM (AN/ASN-123 TACNAV)

The component replacement program for the TACNAV required the Fleet to send an unmodified system to Teledyne before they could receive a modified version. Although partly buffered by the initial pool at Teledyne and by smaller pools set up at functional air wings, it still resulted in excessive periods of time when aircraft were not fully mission capable (FMC). This was compounded when the modification production line experienced delays during its first few months of operation.

In the initial screening process for old configurations, a lack of a comprehensive worldwide screen and aggressive follow-up action led to numerous delays in identifying where the assets were located and expediting them to Teledyne.

PUK mobility, although a problem, could have been effectively dealt with through sufficient planning and coordination. Teledyne's initial policy of accepting only complete systems did much to hamper the return from Fleet activities of all assets that would eventually need modification.

In early 1987, with all SH-2 installed components modified, but only a handful of spares and supporting piece parts available, the decision to immediately commence the SH-3 modification program seemed premature. This was later borne out when the readiness of both aircraft were impacted due to lack of spares.

B. CASE STUDY--AUTOMATIC STABILIZATION EQUIPMENT (ASE)

In this component replacement program, Fleet activities could first order and receive the modified system before sending in the unmodified component. It made more sense from an aircraft readiness standpoint, but required a large initial pool of modified systems. The decision to use removed SDLM aircraft components for the initial pool, yet still require departing SDLM aircraft to also have modified systems installed, resulted in an insufficient quantity for this pool. Shortages of retrograde assets (to be modified) were predictable and occurred almost immediately after commencement of the program.

Suspension of the retrofit program would have caused problems under any circumstances, but the problems were increased in this situation due to the initial practice of implementing the modification in several squadrons simultaneously. Immediately following suspension of the retrofit program, crisis management became the norm as both staff and squadron personnel worked frantically to standardize each squadron. This was especially a problem for squadrons preparing to deploy. It resulted in innumerable man-hours spent on cannibalization and cross-decking efforts.

As in the case of the TACNAV, the inventory spares and piece parts to support the installed ASE system lagged far behind. This has seemed to become an expected and accepted mode of operation for *component modification* programs in general, despite its significant and often long-term effect on aircraft readiness.

C. PROBLEM AREAS BY CATEGORY

1. Spares Lag Behind Installed Changes

Retail allowances for spares and piece parts to support a modification are often requested from ASO at the same time that the installed components are being modified. Wholesale assets to fill the retail consumable allowances are usually either not available or available but insufficient to fill all the demands. In some cases, procurement has not even been initiated at the time that the allowance requests are received at ASO. Procurement lead time for new items can often be three years or longer so the gap between a modified configuration in the aircraft and spares support for that modification can be significant. For aircraft carriers and LAMPS ships, this can quickly lead to serious readiness problems. Thus, what usually occurs prior to a squadron's deployment is a flurry of cross-decking, cannibalizations, and possibly deconfigurations to ensure some measure of spares support.

2. Items Applicable to Specific Production Lots (Lot-Peculiar)

This has been a major problem for the SH-60 and, to a lesser degree, the SH-2. The SH-60 community is currently made up of 105 aircraft which have been produced in five successive lots. Each lot's aircraft have components that are peculiar to that lot. This is due to changes and improvements that have been incorporated in each lot. Over time, the intent is to standardize the configuration of all lots. However, in the interim, support must be provided for a multitude of configurations. [Ref. 26]

The SH-2 is a bit simpler, but the same problems exist. It basically consists of aircraft being produced on a current contract (new buy) and aircraft produced on earlier contracts (old buy). Again, the intent is to standardize the configuration over time. [Ref. 27]

A good example of the problems in supporting a number of different configurations at the retail consumable inventory level is the PUK support for the SH-60. NAS North Island is the largest PUK manager in the Navy. A summary of their operations is provided in Table II. [Ref. 28] For the SH-60, they manage a total of 54 PUK's divided into three categories. The first is a basic kit which is provided to each squadron detachment aboard a ship. The second is an out-of-area (OOA) PUK, an augment to the basic kit for detachments operating far away from a ready source of supply. The third is a two-aircraft PUK, an augment to the basic for detachments operating with two aircraft vice one.

TABLE II

PACK-UP KITS MANAGED BY NAS NORTH ISLAND

Aircraft Type	Type of PUK	Number of PUK's	Number of Line Items Per PUK
SH-60	Basic	31	2000
SH-60	OOA	13	42
SH-60	2 A/C	10	14
SH-2	Basic	33	667
SH-2	OOA	1	75
CH-46	Basic	11	1603

All of the allowance levels are standardized for the basic, OOA, and two-aircraft PUK's. However, actual on hand assets can vary widely, especially for those items supporting a recent modification (initial asset shortage). By their very nature, many of the lot-peculiar items are a result of a recent modification. Therefore, some PUK's may support particular lot aircraft better than others. However, since many PUK's are on ships and not under the direct control of a supporting NAS, intensified management to optimally support different configurations with available assets is not possible.

3. Family Group Coding

As mentioned previously, family groupings are items sharing some level of interchangeability. Each family is assigned a four digit alpha-numeric code called a Family Group Code (FGC). This has proven to be effective in the management of inventories by the ICP (ASO). It has also been useful at the Fleet level by directing attention toward substitutes when the primary item is not available.

Problems that have developed with FGC support during component modifications are attributable to two major causes. The first is that interchangeability codes assigned to spares have commonly been in error. This allows items with no interchangeability relationship to be in the same family group and allows other items that are fully interchangeable to be assigned in different family groups. An example of this is the torqueless grips rotor brake for the SH-60. [Ref. 26] The old brake, national stock number (NSN) 1RD1630-01-161-4376, was modified to a new configuration, NSN 1RD1630-01-275-5612. Both are fully interchangeable with each other, yet belong to different family groups. This situation is currently being corrected, but has already caused problems in AVDLR and retail inventory support. [Ref. 29] In AVDLR, if the old item becomes not-ready-for-issue (NRFI) and is turned in and a modified component is then ordered, no credit is given for the turn-in since the family group is different. As mentioned previously, this requires the NAS to challenge each transaction in order to prevent being charged a higher price than would normally be charged. [Ref. 30] In the retail inventory support area, a requisition for a particular item is not automatically referred to the interchangeables or substitutes if the first is not available. Again, it requires manual intervention to ensure that all possible sources are screened. This manual process causes long delays which may be critical to aircraft awaiting parts.

The second cause of FGC problems stems from the methodology used by ASO to make FGC assignments. Items that are only interchangeable if modified are considered to have some level of interchangeability. Therefore, they are placed in the same family. This has created a number of problems for the squadrons by filling demands for modified components with unmodified components and vice versa. In many cases, these components cannot be used in aircraft due to differing interface elements. An example is the main gearbox for the SH-3. [Ref. 31] A related problem experienced by NAS North Island is the inability of their automated inventory system to manage two items having the same FGC at separate allowance levels in the retail inventory. They have managed to work around this to some extent through the use of locally assigned family group codes. [Ref. 32] These can further differentiate between different interchangeability codes within families. A problem still exists, however, in the interface with the wholesale and retail intermediate inventories which are managed by centrally assigned FGC's.

4. AVDLR Funding Problems--NAS Level

The lack of credit for turn-ins due to FGC variances has been discussed in the preceding section. The other major problem in AVDLR funding and component modifications is the fact that numerous components are now being locally funded out of the NAS AVDLR budget vice being centrally funded. This has caused a strain on already scarce AVDLR dollars at the NAS level. It is also extremely difficult for the NAS to estimate the budget requirement for modifications in advance since they are not included in the initial planning phases for modifications. At times, the NAS has been reimbursed for dollars spent on a specified modification program but this is the exception rather than the rule. [Ref. 33]

VI. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The Naval aircraft modification program has been vital in achieving a cost-effective and safe approach to meet mission requirements for the Naval Air Forces. The program, as defined, allows for an orderly procession of events from change recommendations to implementation. Configuration Management ensures careful analysis of each change (necessity, urgency) and interim support provides a tool to help close the time gap between the modification and spares/piece parts support.

Unfortunately, modification implementations have not always followed established procedural guidelines. The combination of rapidly changing technology, increasing safety awareness, and a continual reevaluation of threat results in a high frequency of changes which often outpaces inflexible procedures. This places implementing activities in a reactive mode, expending excessive man-hours and other resources in an attempt to meet deadlines.

Specific problem areas highlighted have included component replacement procedures, implementation schedule, lag between changes to installed components and spares support, lot-peculiar item support, family group coding problems, and AVDLR funding shortfalls. These and other problems were clarified through the development of two case studies and numerous other examples. The intent was to show the extent of modification implementation problems and their associated impact on fleet readiness. Although the study was limited to three aircraft types, the problems are generic in nature and apply to other aircraft types as well.

B. RECOMMENDATIONS

To resolve or alleviate problems discussed thus far, eleven recommendations will now be presented. A few of these recommendations are currently being followed, but not on a consistent basis. A cost-benefit analysis for each of the recommendations is provided in Appendix E. [Ref. 34]

1. Give Fleet Activities Advantage on Component Replacement Programs

In the two case studies previously discussed, there was one major difference on policy for replacing installed components. In the TACNAV, Fleet activities had to turn in an unmodified system before receiving a modified system. In the ASE system, Fleet activities could requisition and receive a modified system before sending in the unmodified system. This latter policy is preferred, since it minimizes the time that aircraft are missing components. It assumes that the old configuration is not a safety hazard and that sufficient pool assets of modified components are available.

2. Rapidly Identify and Coordinate with Activities Having Old Configurations

Prior to modification implementation, an effective one-time worldwide screen for old assets (including unauthorized spares) should be conducted by a central authority (i.e., NAVAIR, ASO) vice delegating the screen execution down through the chain of command. Those in the chain of command should be fully informed of the screen and become actively involved with coordinating the schedule of retrograde movement. PUK coordination should come under the direct control of the NAS owning the assets, whether they be physically at the NAS or on loan to a ship.

3. Ensure Modification Policies do not Conflict with Retrograde Movement

All retrograde needing modification should not be hampered by contractor policy (i.e., accept only complete systems). If the policy cannot be changed, retrieval from the Fleet should still occur and collection and integration, if possible, could occur at some intermediate point. Due to the Fleet's operations and often remote locations, opportunities to retrieve should be taken as schedules permit.

4. Finish Spares Support for One Aircraft Type Before Starting Modification of Installed Components on Another

In a component modification program affecting more than one aircraft type, all installed components are normally modified on one type before proceeding to the next.

It would also seem prudent to ensure adequate spares support for the first type before proceeding to the next. This not only prevents a lack of support and readiness degradation in multiple aircraft types/mission areas, but also puts pressure on the spares support structure to keep pace with modifications.

5. Modify One Squadron at a Time

Standardization must be one of the guiding principles throughout a component modification process to lessen the complexities of logistics support. Modified components produced on a piecemeal basis should be incorporated in one squadron at a time. This will do much to lessen the impact of any suspensions or delays in retrofit programs.

6. Expedite Navy Spares Support for Modifications

With recent emphasis on competition, fairness to small businesses, and other trends in the purchasing arena, procurement lead time for new items has increased dramatically. This places an even greater burden upon NAVAIR to notify ASO as early as possible concerning component modification spares and piece parts requirements. It does little good for retail allowances to be established if there are no assets in the wholesale system to fill them.

In addition, selective expediting of spares tailored to each change and prioritization by change dates needs to be emphasized.

7. Contract for Interim Support in Cases Where Navy Spares Support Cannot Keep Pace

Interim support has been used successfully to ensure adequate spares support for new weapons systems entering the Fleet. On a smaller scale, it could be just as effective for component modification programs. The additional costs for expanded interim support would be offset by those now being expended due to lack of spares (cannibalization, cross-decks, readiness degradation).

8. Improve Tailoring of Retail Allowances to Support Differing Configurations

Situations in which long-term changes preclude standardization within an aircraft type for an extended period of time (multi-year) require some tailoring of inventory support. Decreasing numbers of unmodified systems and increasing numbers of modified systems need to be supported simultaneously. Thus far, a limited amount of tailoring occurs in the SHORCAL and AVCAL but the process lacks central direction. Retail activities must request splinter (allowance augment due to change) SHORCAL's/AVCAL's as needs arise, often when the changes are actually being implemented. This is often too late to support early failures of the modified system from the retail level, even with wholesale assets available. Support for the old configuration often remains in the inventory until long after the modification is completed, contributing to the amount of excess stock.

Tailoring PUK allowances is non-existent. When a modification program begins or when a change is implemented on the production line (lot-peculiar items), support is incorporated into all PUK's for the aircraft type. In the case of the SH-60 at NAS North Island, this means that a change which begins in one or two aircraft and proceeds slowly will result in immediate allowance increases to all 31 basic PUK's. This puts 31 active requisitions into the system for a particular item when only a few items will actually be needed in the near term. These requisitions may be competing with urgently needed AVCAL/SHORCAL requirements. The end result may be oversupport in PUK's and undersupport in SHORCAL's/AVCAL's. Additionally, obsolete items are often not deleted from the PUK's until long after the modification has been completed, taking up critical space on the LAMPS ships.

9. Increase Review and Validation of Interchangeability Codes for Systems Being Modified

Interchangeability code assignment errors can seriously impact aircraft readiness and AVDLR budgets. This is especially true for modified systems. A formal review of codes assigned should be part of the component modification process.

10. Redesign the FGC/Interchangeability Code (IC) Interface to Allow Some Differentiation by IC Within Families

The wholesale, intermediate, and retail inventory systems must be able to distinguish between modified and unmodified items within the same family when setting stock levels and issuing material. This is a prerequisite to the tailoring effort discussed previously.

11. Centrally Fund Requirements for Modification of Installed Components

All modified components listed in the Technical Directive for installation in aircraft should be centrally funded. An exception is in cases where local (NAS) funding would preclude extensive time delays in implementing urgent changes. Under these situations, reimbursement should be forthcoming from the central fund.

APPENDIX A
FORMAT, PROPOSED RAMEC SPEEDLETTER TECHNICAL DIRECTIVE

Format, Proposed RAMEC Speedletter Technical Directive

To: Cognizant Functional Wing

Subj: PROPOSED RAMEC, ____

Ref: (a) As applicable

Encl: (1) As applicable

1. Cog Code: (Originator's name, activity, AUTOVON telephone number)

2. Category: Routine or urgent

3. Documentation Affected:

   a. (List NAVAIR publications affected by change.)
   b. (List vendor/CFA drawings)

NAVAIREWORKFAC (Applicable T/M/S CFA)

From: Originating activity

Subj: PROPOSED RAMEC

4. Purpose: (Provide full justification for change).

5. Application:

a. Basic Equipment T/M/S S/N

b. Trainers: (State if applicable)

c. Spares: (State if applicable)

6. Compliance:

a. Basic Equipment: Shall be modified by organizational (or intermediate, as applicable) maintenance activities, not later than next phase inspection after receipt of parts.

b. Trainers: (State if applicable)

c. Spares: (State if applicable)

7. Man-hours required:

a. Basic Equipment:

No. of Men	Skill	Total Man-hours
________	______	_________

b. Trainers: ___________.

c. Spares: ___________.

8. Supply Data:

a. Requirements for basic equipment:

(1) Parts/material required:

QTY	P/N	FSCM	NOMEN	SM&R	NSN	SOURCE
	_____	_____	________	_____	_____	_____

(2) Peculiar Ground Support Equipment required: ______

(3) Parts/material removed:

QTY	P/N	NOMEN	NSN	DISPOSITION
___	______	________	________	________

b. Requirements for trainers: _________.

c. Requirements for spares: _________.

9. Reidentification:

Prev P/N	Prev NIIN	Nomen	Superseding P/N	Superseding NIIN
________	________	________	________	________

10. Detailed Instructions:

a. (Provide complete detailed instructions on how to accomplish modification, including reference to tech manuals and other data required to locate particular items. If both "O" and "I" level work is involved, segregate into two parts, grouping actions required by each level of maintenance.)

11. Weight and balance: (Compute effective as applicable.)

12. Records affected: Record accomplishment of this directive in OPNAV Form 4790/24A and update ATDR lists two (2) and four (4), as appropriate. Report compliance via OPNAV Form 4790/60 (VIDS/MAF).

13. Verified by: (To be completed by functional wing commander; including activity, aircraft type and BUNO, if applicable.)

14. Rescission date: (Leave blank.)

15. Related instructions/information: (Include any data package, requirements, special instructions and detailed justifications, if publications or parts costs are anticipated to exceed guidelines.)

By direction

APPENDIX B
SAMPLE--NAVAIR APPROVED RAMEC MESSAGE
TECHNICAL DIRECTIVE

SAMPLE

NAVAIR APPROVED RAMEC MESSAGE TECHNICAL DIRECTIVE

ROUTINE

FROM: COMNAVAIRSYSCOM WASHINGTON DC

TO: AIG ONE SIX FIVE

AIG THREE

NOTE: SEE CURRENT ISSUE NAVAIRNOTE 5215 FOR SUPPLEMENTAL AIGS

INFO: (AS REQUIRED)

NOTE: INFO FOREIGN GOVERNMENT(S) AS APPLICABLE, PER NAVAIRINST 5605.3A.

USE SSIC
N13052 FOR
FINAL RAMEC TD's

UNCLAS //N13052//

SUBJ: A-7 AIRFRAME CHANGE NO. 403, TD CODE 50, EPP ADVISORY LIGHT INSTALLATION (RAMEC P-10-85), WUC 44216

A. MSG OR SPEEDLETTER THAT SUBMITTED PROPOSED RAMEC TO NAVAIRHQ

1. COG CODE: NAME, CODE AND AUTOVON OF THE COGNIZANT ENGINEER. NAME, CODE AND AUTOVON OF THE LOGISTICS MANAGER.

NOTE: INCLUDE BOTH COGNIZANT ENGINEERING AND LOGISTICS CODES

2. CATEGORY: ROUTINE ("URGENT" ONLY IF SAFETY IS INVOLVED AND APPROVED BY CCB)

3. DOCUMENTATION AFFECTED: (SAME AS INCOMING MESSAGE OR SPEEDLETTER)

NOTE: FOR AMENDMENTS, ONLY SHOW BASIC TD NUMBER AND DATE-TIME GROUP OF THE MESSAGE.

4. PURPOSE: (SAME AS INCOMING MESSAGE)

DISTRIBUTION: (NAVAIRHQ)
AIR-1022/ 41054/ 410 ___/ 411 ___
51 ___/ PMA/APC___/ 723I/ 07E1/FC

CHOP CYCLE: NAVAIRHQ

AIR-05 ENG____ AIR-51____
APML/LM_____ AIR-41054 _____
PMA/APC _____ AIR-1022______

PARAGRAPH 5. THROUGH 14. - SAME FORMAT AND CONTENT AS ENCLOSURE (3)

15. RELATED INSTRUCTIONS/INFORMATION:

A. RAMEC P-10-85 SUBMITTED BY REFERENCE (A) WAS APPROVED 14 MAR 85 BY ACCB NO. 851-109.

B. NAVAVDEPOT. (IDENTIFY NAVAVDEPOT or CFA)

(1) PROVIDE MICROFILM COPIES OF NEW OR REVISED DRAWINGS TO NAVAIRTECHSERVFAC, CODE 03 .

(2) PREPARE AND COORDINATE PUBLICATIONS DATA PACKAGE SUBMITTAL WITH NAVAIRTECHSERVFAC, CODE 02D, AND

(3) PREPARE AND FORWARD DESIGN CHANGE NOTICES TO ASO, CODE WSS2-A.

C. NAVAIRTECHSERVFAC: COORDINATE TECHNICAL MANUAL UPDATES WITH NAVAVDEPOT AND CONTRACTOR, AND ORDER AS REQUIRED.

APPENDIX C
TECHNICAL DIRECTIVE CODES

APPENDIX L

Technical Directive Codes

(Alphabetic)

CODE	TITLE
58	Accessory Bulletins (AYB)
61	Accessory Changes (AYC)
94	Airborne Tactical Software Bulletins (ASB)
93	Airborne Tactical Software Changes (ASC)
76	Airborne Weapon Bulletins (AWB)
75	Airborne Weapon Changes (AWC)
67	Aircrew System Bulletins (ACB)
66	Aircrew System Changes (ACC)
74	Airframe Bulletins (AFB)
50	Airframe Changes (AFC)
57	Aviation Armament Bulletins (AAB)
56	Aviation Armanent Changes (AAC)
55	Avionics Bulletins (AVB)
54	Avionics Changes (AVC)
52	Dynamic Component Bulletins (DCB)
51	Dynamic Component Changes (DCC)
79	Meteorological Equipment Bulletins (MEB)
73	Meteorological Equipment Changes (MEC)
69	Photographic Bulletins (PHB)
68	Photographic Changes (PHC)
01	Power Plant Bulletins (PPB)

CODE	TITLE
02	Power Plant Changes (PPC)
65	Propeller Bulletins (PRB)
64	Propeller Changes (PRC)
04	Quick Engine Change Kit Bulletins (QEB)
03	Quick Engine Change Kit Changes (QEC)
84	Ship Installed and Expeditionary Airfield Launch, Recovery, and Visual Landing Aid Equipment Bulletins (LRB)
83	Ship Installed and Expeditionary Airfield Launch, Recovery, and Visual Landing Aid Equipment Changes (LRC)
63	Support Equipment Bulletins (SEB)
62	Support Equipment Changes (SEC)
96	Support Software Bulletins (SSB)
95	Support Software Changes (SSC)
78	Target Control System Bulletins (TCB)
77	Target Control System Changes (TCC)
98	Trainer Software Bulletins (TSB)
97	Trainer Software Changes (TSC)
88	VAST Interface Bulletins
87	VAST Interface Changes
86	VAST System Bulletins
85	VAST System Changes

APPENDIX D
ASN-123 TACNAV/SH-2F RETROFIT PROGRAM

ASN-123 TACNAV/SH-2F RETROFIT PROGRAM (ECP-13)

PRESENTATION FOR:
PMA-274
12 FEBRUARY 1985

ASN-123/SH-2F RETROFIT PROGRAM

* **MICROMANAGE PROGRAM**
    * "HAND MASSAGE" INSTALLS/SPARES TO AND FROM SQUADRONS AND TSC
    * MAINTAIN CLOSE COORDINATION WITH RETROFIT PARTICIPANTS
    * SQUADRON RETROFIT SCHEDULES FLEXIBLE

* **RETROFIT SCHEDULE SUMMARY**
    * TSC ON CONTRACT: MARCH 1985
    * FIRST MODIFIED SYSTEMS DELIVERED: JULY 1985
    * AIRCRAFT MODIFICATION: JULY 1985–JULY 1988

ASN-123/SH-2F RETROFIT PROGRAM
TASKS

* **NAVAIR**
  * PROVIDE FUNDING
  * AWARD CONTRACTS
  * PROVIDE OVERALL PROGRAM DIRECTION
* **TYCOMS/WINGS**
  * ESTABLISH RETROFIT SCHEDULES
  * ESTABLISH DEPLOYMENT SCHEDULES
* **ASO**
  * PROVIDE FLEET INVENTORY DATA
* **NESO PNCLA**
  * PREPARE RETROFIT AFC
  * UPDATE "O" LEVEL PUBLICATIONS

ASN-123/SH-2F RETROFIT PROGRAM

TASKS (CONT.)

* **NESO NORIS**
    * MANAGE RETROFIT PROGRAM
    * DIRECT THE SHIPMENT OF INSTALLS AND SPARES
    * MAINTAIN CLOSE COORDINATION WITH RETROFIT PARTICIPANTS
* ***TSC***
    * MODIFY/DELIVER RETROFIT SYSTEMS/SRAs
    * REVISE "I" LEVEL PUBLICATIONS
    * MODIFY/DELIVER SUPPORT EQUIPMENT (ECP-10)
    * PROVIDE TECHNICAL SUPPORT

ASN-123/SH-2F RETROFIT PROGRAM

ASSUMPTIONS

* TSC RETROFIT (ECP-13) CONTRACT AWARD MARCH 1985
* TECHNICAL SUPPORT PROVIDED BY FLEET/CETS
* LOGISTICS SUPPORT PROVIDED BY NESO NORIS
* SH-2F PRELIMINARY TD IN PLACE BY MAY 1985
* UTILIZE 8 PIP SYSTEMS (ECP-10) PACK UPS IN MAY 1985 TO INITIATE ROTABLE POOL AT TSC
* UTILIZE 8 NON PIP SYSTEMS FROM FLEET IN JUNE 1985 FOR ROTABLE POOL AT TSC
* CONTRACT FOR NEW BUY SPARES IN PLACE AT TSC BY MARCH 1985
* ALL AIRCRAFT RETROFITED CONUS BY SQUADRONS
* TYCOMS/WINGS ESTABLISH RETROFIT SCHEDULES
* FUNDING TO NESO NORIS REQUIRED BY APRIL 1985 FOR SPECIAL SHIPPING OF SYSTEMS

ASN-123/SH-2F RETROFIT PROGRAM

ISSUES

* MINIMUM OF 8 PIP COMPUTER MOUNTS NEEDED BY MAY 1985

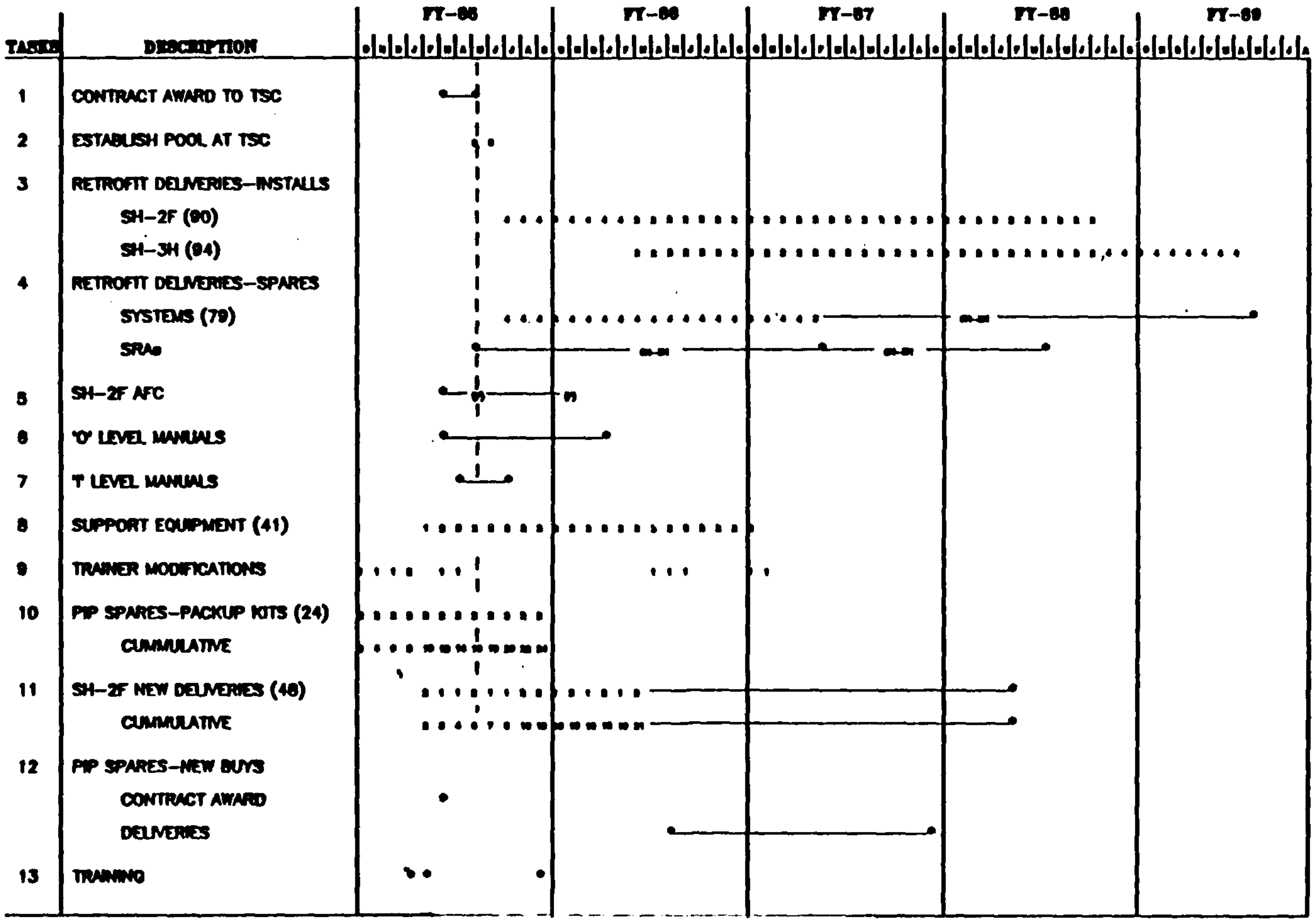
* NEEDED CONTRACT FOR REPAIR OF PIP SYSTEMS IN PLACE AT TSC BY MARCH 1985

* LACK OF PIP SPARES AFFECTS DEPLOYMENT OF PIP CONFIGURED AIRCRAFT

* REASSESS SH-2F/SH-3H SPARES POSTURE

PRODUCT IMPROVEMENT PROGRAM (PIP)
SH-2F AIRCRAFT
AN/ASN-123 TACNAV RETROFIT

STATUS DATE: 2/12/85



ASN-123 TACNAV SPARES
FEBRUARY 1985

	01-086-2071 COMPUTER	01-086-3795 DISPLAY IND.	01-087-2410 CONTROL IND.	01-134-2045 CONTROL	01-086-4207 MOUNT
USS Midway					
USS K. Hawk	0	3	1	0	0
USS Enterprise	2	1	1	0	0
USS Constellation	0	0	1	0	0
USS Vinson	2	1	1	1	0
USS Badger	1	1	1	0	0
USS Brewton	1	1	1	0	0
USS Callaghan					
USS Downes	2 (1 NRFI)	2	1	1	0
USS Fanning	1	1	1	1	0
USS Fletcher	0	0	1	0	0
USS P. Foster	0	0	0	0	0
USS Hammond	0	0	0	0	0
USS Hepburn	1	1	1	0	0
USS Hewitt	2	2	1	0	0
USS Kinkaid	1	1	1	0	0
USS Kirk					
USS Knox					
USS Leftwich					
USS Lockwood	1	1	1	1	0
USS Oldendorf	1	1	1	1	1
USS Peary	0	0	1	0	0
USS Roarke	0	1	1	1	0

ASN-123 TACNAV SPARES
FEBRUARY 1985

	01-086-2071 COMPUTER	01-086-3795 DISPLAY IND.	01-087-2410 CONTROL IND.	01-134-2045 CONTROL	01-086-4207 MOUNT
USS Young	1	1	1	0	0
Cubi Point	2	2	4	7	0
NAS N. Island	6	18	14	11	1
NAS Barbers Point	3	0	0	3	1
NSD Subic Bay	0	0	0	0	0
NAF Atsugi Japan	0	0	4	4	0
NAVSUPO Pensacola	0	0	0	0	4 (NRFI)
TOTAL ASSETS, EXCLUDING THOSE NOT YET RESPONDING	27	38	39	31	7
HMX 1 Quantico, VA	0	0	0	0	0
USS Clark Not carried	0	0	0	0	0
NERRA Naples, IT	0	0	0	0	0
USS Mississippi	0	0	0	0	0
Helantisubron 1 Sea Det One Not carried	0	0	0	0	0
NAVFAC Bermuda Not carried	0	0	0	0	0
USS McCandless	2	2	1	0	0
USS Eptocin	2	2	0	0	0
USS Capodonna	0	1	1	0	0
USS Eisenhower	1	0	1	0	0
NAVFAC Argentina, CAN Not carried	0	0	0	0	0
Helantisubron 3		All Installs O/H			

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	01-086-2071 COMPUTER	01-086-3795 DISPLAY IND.	01-087-2410 CONTROL IND.	01-134-2045 CONTROL	01-086-4207 MOUNT
NAS S. Weymouth, MA	0	0	0	0	0
USS Voge	0	0	0	0	0
Namtragrudet Meridian, MS	0	0	0	0	0
Namtragrudet Corpus Christi, TX	0	0	0	0	0
Helantisubron 11	1 each installs				
Helantisubron 7	0	0	0	0	0
Namtragurdet Norfolk, VA	Installed in trainer - 1 of each				
USS Stark	2	2	1	1	0
USS Nimitz	2	1	1	0	0
Brawdy UK Not carried	0	0	0	0	0
NAS Sigonella, IT	0	4	2	0	1
NAVCOMMSTA Rota, SP Not carried	0	0	0	0	0
Oceanounit 5 Not carried	0	0	0	0	0
Flecompron 8 Not carried	0	0	0	0	0
Airtevron 1	3 of each - installs				
NAVSUPO NAS Norfolk, VA	(16) 1*	(16) 1*	(16) 1*	(16) 1*	(16) 1*
USS Saratoga	2	2	1	0	0
Helantisubron 15	6	6	6	6	6
NAS Pax River, MD	1	0	0	0	0

( ) "L" purpose out of area pack-ups - all deployed
* AIMD for test bench

ASN-123 TACNAV SPARES
FEBRUARY 1985

	01-086-2071 COMPUTER	01-086-3795 DISPLAY IND.	01-087-2410 CONTROL IND.	01-134-2045 CONTROL	01-086-4207 MOUNT
USS Spruance	1	1	1	0	0
		1 each - installs			
Comoceansysplant Norfolk, VA Not carried	0	0	0	0	0
Navairengcen Lakehurst, NJ	0	0	0	0	0
Namtragrudet Milton, FL	0	0	0	0	0
USS Coral Sea	0	0	0	0	0
Navsta Roosevelt Rds PR	0	0	0	0	0
USS America	1	0	0	0	0
Helsuppron 8	0	0	0	0	0
Helantisubron Light 34	10	10	10	10	10
Helantisubron Light 30			7 each - all installs		
USS Independence	4	2	0	0	0
Namtragrudet Willow Grove, PA	0	0	0	0	0
Namtragrudet Lemoore, CA	0	0	0	0	0
Helantisubron Light 36			4 each - all installs		
Namtragrudet Jacksonville, FL	1	0	1	1	0
NAS Norfolk, VA	1	0	0	0	0
TOTAL RFI	53	50	43	35	34

ASN-123 TACNAV SPARES
FEBRUARY 1985

	01-086-2071 COMPUTER	01-086-3795 DISPLAY IND.	01-087-2410 CONTROL IND.	01-134-2045 CONTROL	01-086-4207 MOUNT
			TOTALS		
TOTAL LANT ACTVS	53	50	43	35	34
TOTAL PAC ACTVS EXCLUDING MIDWAY, CALLAGHAN, KIRK, KNOX, LEFTWICH, PEARY	27	36	39	31	7
ASSETS AT TELEDYNE					
RFI	2	0	0	0	24
NRFI	11	14	15	7	0
GRAND TOTAL OF SCREENED ASSETS TO DATE (1/30/85)	93	100	97	73	65

All activities under CNET, COMNAVRESFOR, and NAMTRAGRU reported Negative responses.

APPENDIX E
COST-BENEFIT ANALYSES

Costs and benefits for each recommendation are identified below. In some cases, quantification is possible but varies widely with different modification programs. In cases where a one-time system cost or benefit could perhaps be quantified, other significant costs and benefits within the same analysis cannot. In many other cases, quantification would at best be a highly subjective procedure. It is therefore left to the decision maker to weigh the identified costs and benefits for each recommendation and determine a course of action.

A. RECOMMENDATION 1--GIVE FLEET ACTIVITIES ADVANTAGE ON COMPONENT REPLACEMENT PROGRAMS

1. **Costs**:

   - Larger initial pool of modified assets

2. **Benefits**:

   - Increased aircraft readiness due to less aircraft down time awaiting components
   - Decreased cross-decking and cannibalization efforts

B. RECOMMENDATION 2--RAPIDLY IDENTIFY AND COORDINATE WITH ACTIVITIES HAVING OLD CONFIGURATIONS

1. **Costs**:

   - Increased coordination/monitoring efforts at NAVAIR, ASO, Staff, and NAS levels

2. **Benefits**:

- Improved asset visibility/accountability
- Improved movement flow of unmodified and modified assets between Fleet and modification facility

C. RECOMMENDATION 3--ENSURE MODIFICATION POLICIES DO NOT CONFLICT WITH RETROGRADE MOVEMENT

1. **Costs**:

- Increased vendor charge for more flexibility in modification process
- Increased costs associated with maintaining temporary pools of unmodified assets

2. **Benefits**:

- Improved flow of unmodified assets from Fleet to modification facility

D. RECOMMENDATION 4--FINISH SPARES SUPPORT FOR ONE AIRCRAFT TYPE BEFORE STARTING MODIFICATION OF INSTALLED COMPONENTS ON ANOTHER

1. **Costs**:

- Increased potential for loss of funding source for modification of subsequent aircraft types due to extended time frame
- Extended operations with unmodified components by subsequent aircraft types

2. **Benefits**:

- Increased aircraft readiness due to improved spares support
- Increased pressure on spares support structure to keep pace with aircraft component modifications
- Less expediting costs in meeting customer demands
- Decreased cross-decking and cannibalization efforts

E. RECOMMENDATION 5--MODIFY ONE SQUADRON AT A TIME

1. Costs:

- No significant net costs

2. Benefits:

- Improved logistics support (spares, training, maintenance) due to configuration standardization
- Decreased cross-decking, cannibalization, and deconfiguration efforts in case of suspension/delay in retrofit program

F. RECOMMENDATION 6--EXPEDITE NAVY SPARES SUPPORT FOR MODIFICATIONS

1. Costs:

- Increased efforts by NAVAIR and ASO in identifying and expediting spares to support modifications

2. Benefits:

- Increased aircraft readiness due to improved spares support
- Less expediting costs in meeting customer demands
- Decreased cross-decking and cannibalization efforts

G. RECOMMENDATION 7--CONTRACT FOR INTERIM SUPPORT IN CASES WHERE NAVY SPARES SUPPORT CANNOT KEEP PACE

1. Costs:

- Increased purchasing costs due to small quantity buying and vendor services
- Less pressure on Navy spares support structure to keep pace with modifications

2. Benefits:

- Increased aircraft readiness due to improved spares support
- Less Navy inventory management costs in cases where contractor manages assets

- Less expediting costs in meeting customer demands
- Decreased cross-decking and cannibalization efforts

H. RECOMMENDATION 8--IMPROVE TAILORING OF RETAIL ALLOWANCES TO SUPPORT DIFFERING CONFIGURATIONS

1. Costs:

- Increased efforts by ASO in managing tailored inventories
- Increased coordination between all echelons in continual updating process required under tailoring concept

2. Benefits:

- Increased aircraft readiness due to improved spares support (primarily in cases where initial asset shortages are overcome via tailoring)
- Fewer assets required in inventory during the modification process
- Less expediting costs in meeting customer demands
- Decreased cross-decking and cannibalization efforts

I. RECOMMENDATION 9--INCREASE REVIEW AND VALIDATION OF INTERCHANGEABILITY CODES FOR SYSTEMS BEING MODIFIED

1. Costs:

- Increased efforts by NAVAIR and ASO to ensure interchangeability codes for modified items are valid

2. Benefits:

- Increased aircraft readiness due to both decreases in issue of erroneous stock and increases in issue of valid substitutes
- Improved management of AVDLR budget at NAS level by improving the tracking and crediting of NRFI repairables

- Less expediting costs in meeting customer demands
- Decreased cross-decking and cannibalization efforts

J. RECOMMENDATION 10--REDESIGN THE FGC/INTERCHANGEABILITY CODE (IC) INTERFACE TO ALLOW SOME DIFFERENTIATION BY IC WITHIN FAMILIES

1. Costs:

- System enhancements in the management of all three inventory levels
- Increased complexity in inventory management

2. Benefits:

- Increased aircraft readiness due to improved stockage and issue of valid stock
- Less expediting costs in meeting customer demands
- Decreased cross-decking and cannibalization efforts

K. RECOMMENDATION 11--CENTRALLY FUND REQUIREMENTS FOR MODIFICATION OF INSTALLED COMPONENTS

1. Costs:

- No significant net costs

2. Benefits:

- Improved management of AVDLR budget at NAS level

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